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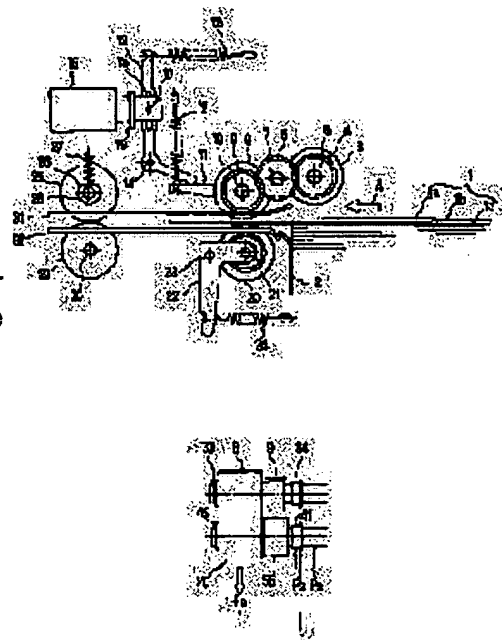
(54) PAPER FEEDING DEVICE

(57)Abstract:

PURPOSE: To reliably prevent overlap-feeding of paper sheets by separating sheet-like bodies to be conveyed between a feed roller and a reverse roller one by one, and controlling press-returning force of the reverse roller on the basis of the thickness of the sheet-like bodies.

CONSTITUTION: In a reverse roller 20, the pressing force and the limit torque are set by the actions of a pressurizing lever 22, a spring 24 and a torque limiter 56 so as to satisfy the specified paper feeding condition.

When there is no paper sheet between a feed roller 8 and the reverse roller 20 or there is only one sheet, the reverse roller 20 and the feed roller 8 are follow-rotated by idling of the torque limiter 56. Since the torque limiter 56 is not idled when there are two or more paper sheets, the reverse roller 20 is reversely rotated so as to return the second and the later paper sheets. In this case, the thickness of the paper sheet is detected by a paper sheet thickness detecting sensor, a solenoid 16 is driven on the basis of the detected thickness, and the press-returning force of the reverse roller 20 is controlled.



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CLAIMS

[Claim(s)]

[Claim 1] It is feed equipment which dissociates at a time one leaf and feeds with the loaded sheet-like object. It consists of reverse rollers countered and formed in the feed roller which conveys a sheet-like object in the conveyance direction, and this feed roller. The sheet-like object which has between these feed rollers and reverse rollers conveyed. An every one leaf separation means to dissociate, Feed equipment characterized by providing a thickness detection means to detect the thickness of the sheet-like object separated by this separation means, and the control means which controls ***** of said reverse roller based on the detection information concerning the thickness of the sheet-like object concerned detected with this thickness detection means.

[Claim 2] Said control means is feed equipment according to claim 1 characterized by controlling ***** through a controllable transfer torque control means electrically [act only on said reverse roller and].

[Claim 3] Said control means is feed equipment according to claim 1 characterized by controlling ***** of said reverse roller intermittently.

[Claim 4] It is feed equipment according to claim 1 characterized by controlling ***** of a reverse roller at the time more than of the twice of the minimum thickness which can feed with the thickness detection value of the sheet-like object concerned in case said control means feeds with the sheet-like object of the 1st sheet.

[Claim 5] Said control means is feed equipment according to claim 4 characterized by performing reexamination control of ***** of a reverse roller based on the existence of the thickness detection value change of a sheet-like object when predetermined time passes.

[Claim 6] Said control means is feed equipment according to claim 5 characterized by amending a resisted part by the self-weight of a sheet-like object in case ***** of a reverse roller is looked over again.

[Claim 7] Feed equipment according to claim 1 characterized by providing a storage means to memorize the detection value detected with said thickness detection means as thickness of the sheet-like object concerned.

[Claim 8] Said control means is feed equipment according to claim 1 characterized by updating a double feed decision value after carrying out the predetermined number-of-sheets feed of the sheet-like object at the time more than of the twice of the minimum thickness which can feed with the thickness detection value of the sheet-like object concerned, in case it feeds with a sheet-like object.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the feed equipment used with image formation equipment etc.

[0002]

[Description of the Prior Art] As conventional feed equipment, what is indicated by JP,5-32356,A ("feeding equipment to image formation equipment" Fuji Xerox), for example is known. the case where a double feed and misfeed generate this feed equipment in the form as a sheet-like object sent out from the feed section of image formation equipment -- that detection information -- responding -- a form -- mackerel -- the nip pressure in ***** etc. is controlled automatically and a double feed etc. is prevented. Moreover, the feed equipment used for common image formation equipment consists of a pickup roller located in the sending-area edge of the form held in a form tray, and a deleaving device arranged at the downstream. What countered and has arranged a pad or a roller member for this deleaving device to usually perform the feed roller and segregation which are driven to a feed direction to a form is used. Among these, what what combined the feed roller and the separation pad was used with comparatively small equipment, and combined the feed roller and the roller member, for example, a reverse roller, is used with equipment with comparatively quick processing speed.

[0003] As feed equipment which combined the feed roller and the reverse roller, it is shown, for example in JP,59-69328,A. That is, a drive is transmitted through skid devices, such as a torque limiter, to a reverse roller, and while separating a form by enabling the forward inversion of a reverse roller to the feed direction, he is trying to prevent wear of non-delivery and a roller. When such feed equipment was used and the thickness of a form was changed, it becomes impossible to have performed segregation of a form on the same conditions therefore, the problem of the double feed and non-delivery of a form occurred, and the check by the serviceman, repair, etc. were needed. Then, as it is shown in JP,2-62335,A in order to solve a problem which was mentioned above for example, and shown in a means to adjust nip pressure between the delivery members and reverse members which constitute a deleaving device, and JP,5-32356,A, the proposal which performs this nip pressure adjustment automatically based on the information from the thickness-of-paper detection means arranged down-stream rather than a separation mechanism is made.

[0004]

[Problem(s) to be Solved by the Invention] However, as mentioned above, even if it is made to adjust nip pressure, it is difficult to acquire sufficient prevention effectiveness over the double feed and non-delivery of a form. Moreover, since specified quantity feed has already been carried out in the state of a double feed in the separation section even if it is the case where a metaphor double feed is detected when the thickness-of-paper detection means is arranged down-stream rather than the separation mechanism, even if nip pressure adjusts that a double feed should be canceled, the effectiveness which cancels a double feed is hardly expectable.

[0005]

[Objects of the Invention] While this invention solves the technical problem of the conventional technique mentioned above and preventing certainly the double feed of a form, and generating of non-delivery, it aims at offering the feed equipment which can distinguish distinction of a double feed and pasteboard.

[0006]

[Elements of the Invention] In order to attain the above-mentioned purpose, it sets to invention of claim 1. It is feed equipment which dissociates at a time one leaf and feeds with the loaded sheet-like object. It consists of reverse rollers countered and formed in the feed roller which conveys a sheet-like object in the conveyance direction, and this feed roller. The sheet-like object which has between these feed rollers and reverse rollers conveyed An every one leaf separation means to dissociate, It is characterized by providing a thickness detection means to detect the thickness of the

sheet-like object separated by this separation means, and the control means which controls ***** of said reverse roller based on the detection information concerning the thickness of the sheet-like object concerned detected with this thickness detection means. Moreover, in one desirable example of this invention, a thickness detection means is arranged near the separation means. Moreover, invention of claim 2 is characterized by said control means controlling ***** through a controllable transfer torque control means electrically [act only on said reverse roller and].

[0007] Moreover, invention of claim 3 is characterized by said control means controlling ***** of said reverse roller intermittently. Moreover, it is characterized by controlling ***** of a reverse roller at the time more than of the twice of the minimum thickness which invention of claim 4 can feed with the thickness detection value of the sheet-like object concerned in case said control means feeds with the sheet-like object of the 1st sheet. Moreover, as for said control means, invention of claim 5 is characterized by performing reexamination control of ***** of a reverse roller based on the existence of the thickness detection value change of a sheet-like object when predetermined time passes.

[0008] Moreover, invention of claim 6 is characterized by amending a resisted part by the self-weight of a sheet-like object, in case said control means looks over ***** of a reverse roller again. Moreover, invention of claim 7 is characterized by providing a storage means to memorize the detection value detected with said thickness detection means as thickness of the sheet-like object concerned. Furthermore, invention of claim 8 is characterized by said control means updating a double feed decision value at the time more than of the twice of the minimum thickness which can feed with the thickness detection value of the sheet-like object concerned in case it feeds with a sheet-like object, after carrying out the predetermined number-of-sheets feed of the sheet-like object.

[0009]

[Function] The sheet-like object which has between the reverse rollers which the feed equipment of invention of claim 1 counters the feed roller which conveys a sheet-like object in the conveyance direction, and this feed roller with a separation means, and are formed conveyed every one leaf in case it dissociates Since a control means controls ***** of a reverse roller based on the detection information which detects the thickness of the sheet-like object separated by this separation means with a thickness detection means, and starts the thickness of this detected sheet-like object concerned Even if it is the sheet-like object with the strong adhesion force of sheets, such as an OHP sheet, a double feed is prevented certainly. Moreover, in one desirable example of this invention, since a thickness detection means is arranged near the separation mechanism, it becomes possible to detect change of a double feed and thickness of paper at an early stage, and while separability ability is improved, responsibility also improves.

[0010] The feed equipment of invention of claim 2 acts only on a reverse roller, and controls ***** through a controllable transfer torque control means electrically, and attains high separability ability with a comparatively easy configuration irrespective of the class of sheet-like object. The feed equipment of invention of claim 3 controls ***** of a reverse roller intermittently, and is compatible in improvement in the double-feed-prevention effectiveness, and improvement in endurance using ***** at the time of reverse roller starting.

[0011] ***** of a reverse roller is controlled at the time more than of the twice of the minimum thickness which can feed with the thickness detection value of the sheet-like object concerned in case the feed equipment of invention of claim 4 feeds with the sheet-like object of the 1st sheet, and it makes possible double feed prevention stabilized from the 1st sheet after the sheet set. The feed equipment of invention of claim 5 performs reexamination control of ***** of a reverse roller based on the existence of the thickness detection value change of a sheet-like object when predetermined time passes, by the existence of a thickness detection value change, carries out early detection of a double feed or the normal feed of pasteboard, and separates it on suitable separation conditions.

[0012] In case the feed equipment of invention of claim 6 looks over ***** of a reverse roller again, it amends a resisted part by the self-weight of a sheet-like object, it enables a setup of the separation conditions which were not based on the size of a sheet-like object but were stabilized of it, and raises the double-feed-prevention engine performance. The feed equipment of invention of claim 7 memorizes the separation conditions which possessed a storage means to memorize the detection value detected with the thickness detection means as thickness of the sheet-like object concerned, and were suitable for the thickness of the set sheet-like object, and always enables a setup of the stable separation conditions. After the feed equipment of invention of claim 8 carries out the predetermined number-of-sheets feed of the sheet-like object, at the time more than of the twice of the minimum thickness which can feed with the thickness detection value of the sheet-like object concerned in case it feeds with a sheet-like object, it updates a double feed decision value, adjusts it according to the sheet-like object fed with the double feed decision value, and raises double feed detection precision at it.

[0013]

[Example] Hereafter, the example of this invention is explained with reference to a drawing. First, the typical

configuration of the feed equipment equipped with the deleaving device using a feed roller and a reverse roller with reference to drawing 1 and drawing 2 is explained. When feed actuation is started, if the feed motor 40 starts rotation, turning effort will be first transmitted further to the reverse roller shaft 21 through gears 44 and 55, a shaft 50, and gears 46 and 45 at the clutch section 36 through gears 39 and 38. At this time, rotation immobilization was carried out at the feed shaft 10, and since a clutch 37 is in an OFF condition, the feed koro 8 stopped with the stop ring 33 in the thrust direction has stood it still.

[0014] On the other hand, although the reverse roller 20 can give turning effort in the direction contrary to the conveyance direction A, the feed koro 8 which touches this is supported by the one direction bearing 35 so that it cannot rotate in this hard flow. For this reason, a torque limiter 56 will race the turning effort of this hard flow, i.e., a form, in response to the turning effort more than ***** which carries out ***** separation. As shown in drawing 1, drive connection is carried out through a feed roller 8 and gears 9, 6, and 4, and the pickup roller 3 prepared in the upstream of a feed roller 8 rotates in a feed roller 8 and this direction. Moreover, the revolving shaft 5 of this pickup roller 3 is formed in the rockable pickup lever 11 and rockable one centering on the feed shaft 10.

[0015] After the feed motor 40 starts rotation and predetermined time passes, a solenoid 16 is made to turn on, the plunger 19 currently pulled out by the spring 18 at the time of OFF is drawn, and the pickup drive lever 13 is rotated focusing on the supporting point 14. Then, the pressure welding of the pickup roller 3 is carried out to the maximum top face of the form bundle 1 by the length force of the spring 12 concerning the pickup lever 11. A form bundle is laid in the form tray which is not illustrated, the rise location detection sensor which is not illustrated detects the location of the form bundle best side, and it is controlled by controlling this to become almost fixed so that paper feeding pressure serves as fitness. While a solenoid 16 turns on, the feed motor 40 and a clutch 37 are made to turn on. Then, on the feed shaft 10, it begins to rotate so that a drive may make a form, as for propagation, a feed roller 8, and a pickup roller 3, convey in the direction of A.

[0016] The reverse roller 20 is respectively set up by the pressurization lever 22, a spring 24, and the torque limiter 56 in welding pressure and limit torque so that the feed conditions mentioned later may be fulfilled. Without a torque limiter 56 racing only one sheet by this, at a certain time, by there being no form between a feed roller 8 and the reverse roller 20, the circumference of a companion, and when a form is two or more sheets because a torque limiter 56 races at the feed roller 8 and conveyance direction A side, the reverse roller 20 reverses the reverse roller 20 so that the form after the 2nd sheet may be returned.

[0017] Since these conditioning is adjusted automatically and it corresponds to various papers, environmental conditions, etc., it is made to act on the reverse roller pressurization lever 22 in JP,5-32356,A, or it is a pressure P3. He is trying to move the endpoint of a spring 24 so that it may be made to change. Moreover, accommodation of the shaft-orientations location of a gear of the location where the reverse roller drive gears 45 and 46 gear can be enabled, and the Oshiage moments p and k by the gear can also be changed. However, each of these is the reverse roller welding pressure P3 mentioned later. It is made to change. Therefore, such reverse roller welding pressure P3 It sets to the approach of making it changing, and is the limit torque TA. It is clear that an adjustable range will be restricted by the analysis of the feed conditions mentioned later.

[0018] then, adjustment of transfer torque as shown in drawing 3, without using the torque limiter 56 shown in drawing 2 in this example -- the clutch 48 easy type is used. This is a hysteresis clutch, a powder clutch, etc. by adjusting the transfer torque of this clutch by the existence of a double feed condition, the separation range of a form is boiled markedly and can be extended.

[0019] As mentioned above, fundamentally, this invention detects thickness change of the form conveyed, and judges a double feed. The configuration of a detecting element is shown in drawing 4 and drawing 5. The detection datum level 54 is made to form in a part of guide plate near the separation section, and the pressure welding of the elastic member 52 is carried out by the force of extent which does not bar conveyance of a form so that a form may be conveyed along with this. Into the part which clipped the front face of this elastic member 52, or a part of elastic member 52, the detection light of a reflective mold minute displacement sensor is irradiated, and the minute displacement accompanying thickness change of a form is detected.

[0020] Next, the feed conditions of the method equipped with the feed roller 8 and the reverse roller 20 are explained.

(1) The conditions which return the 2nd paper.

drawing 6 -- $TA > FC + FD + FE$ it is -- if -- the 2nd form is returned with the reverse roller 20. If μP and weight of one sheet of form are set to m for coefficient of friction $TA > \mu P PB + \mu P$ and $m + \mu P .2m$ therefore $PB < (1/\mu P) TA - 3m$ (1) (2) Conditions which send the 1st form.

the conditions which send the 1st form from drawing 7 -- $FB > TA + RA$ -- here -- it is -- coefficient of friction between the reverse roller 20 and a form -- μR [** -- if it carries out -- 0021]

[Equation 1]

$$F_B = \mu_P P_B \cdot \text{また } R_A \simeq \mu_P \cdot m$$

$$P_B > (1 / \mu_P) T_A + (\mu_P / \mu_R) m \quad (2)$$

(1) A formula and (2) Feed conditions [in / from a formula / this method] $(1/\mu_P) T_A - 3m > P_B > (1/\mu_P) T_A + (\mu_P/\mu_R) m$ (3) The field inserted into the shadow area shown in drawing 8 by this serves as range to which paper can be fed.

[0022] Next, the pressurization device of the conventional type shown in drawing 2 is analyzed. Return torque of the torque limiter on the drawing 2 twist reverse roller shaft 21 : RZ PI, Loss torque by friction of a bearing: RB TB and torque RZ PI transmitted to a follower gear Balance Since it is set to RZ PI = RS TA + RB TB (the reverse roller shaft 21 presupposes that it shows around only at Y shaft orientations) PI = (RS/RZ) TA + (RB/RZ) TB (4) Moreover, the supporting point : from balance of the surrounding moment of theta $k_1 P_1 + k_3 P_3 = k_2 P_2 + k_4 P_B$ therefore $P_B = (k_1 / k_4) P_1 + (k_3 P_3 - k_2 P_2) / k_4$ Formula (4) If it substitutes $P_B = (k_1 / k_4) \{ (RS/RZ) TA + (RB/RZ) TB \} + k_3 P_3 - k_2 P_2 / k_4$ (5) It is μ_B about coefficient of friction of a reverse roller bearing here. Then, $TB = \mu_B P_B$ Since it can express $P_B = k_1 / k_4 \{ (RS/RZ) TA + (RB/RZ) \mu_B P_B \} + k_3 P_3 - k_2 P_2 / k_4$ therefore PB ***** -- when a formula is arranged, it can express as follows.
 $K / [P_B = \{ / / / (1 - K - R) / \}] TA + P_0 / (1 - K - R)$ (6) However, $K = (RS/RZ) - (k_1 / k_4)$
 $R = \mu_B (RB/RS)$
 $P_0 = 1/k_4 (k_3 P_3 - k_2 P_2)$

This relational expression is called an actuation line.

[0023] Next, it explains, comparing this example with the conventional example. Feed conditional expression (3) Actuation line type (6) An example is shown in drawing 8 thru/or drawing 10. The detail of each numeric value was omitted here. In drawing 8, the field to which paper can be fed is a field inserted into hatching. an actuation line passes along this field -- as -- the balance of each element -- designing -- limit torque Tr of a torque limiter 56 suitable -- setting up (***** at this time being set to TAO.) -- corresponding PB If the variation in a value is disregarded, it will be uniquely set to PB0. Modification of the feed conditions according to adjustment of the pantograph adherence pressure of the reverse roller pressurization lever 22 when adjustment is needed with the variation in feed conditions is (6). It is modification of the intercept term of the linear function of a formula, and an adjustable range is as having been shown in drawing 8 seemingly.

[0024] Here, a double feed limitation is (1). The case where it changes by the factor which is not contained in the formula is considered. For example, considering existence of existence of the electrostatic force between forms, increase of the adhesion force which happens to the good form of surface smoothness especially, the decision weld flash in a form production process, etc., it is (1). A formula is as follows.

$$P_B < (1/\mu_P) TA - \{ 3m + (1/\mu_P) S \} \quad (7) \text{ (however, S forms adhesion force)}$$

Then, it moves like drawing 9 and a double feed limitation is P3. PB which can be adjusted Range decreases in number, and also when it cannot adjust, it is considered. It sets to this invention here and is TA by modification of limit torque. If it is made to change, the adjustable range of PB will not receive the above-mentioned limit.

[0025] Next, with reference to drawing 11, the configuration of the control system in this example is explained. CPU101 gives the command output to various loads (a motor, a clutch, solenoid) based on the input signal from the various detection means 51, 104-108. Moreover, when it agrees on predetermined conditions, transfer of memory 102 and data is performed. the reflective mold which detects thickness of paper [sensor / 51 / thickness-of-paper detection / near the separation mechanism] by the carrier light emitting device -- a variation rate -- the sensor is used, the electrical-potential-difference value according to the distance from a carrier luminescence side to a detection body is inputted into the analog input terminal of CPU101, and A/D conversion is carried out within CPU, and it is written in on the internal memory of CPU101 as digital value. Moreover, the thickness-of-paper detection sensor 51 may use the differential transformer which detects the variation rate of what detects thickness with the amount of transmitted lights in addition to this, a lever, a roller, etc., etc.

[0026] The closing motion detection sensor 104 is for detecting closing motion of sheathing covering which is opened and closed at the time of the form set of feed equipment, and ejection and which is not illustrated, and a microswitch, transparency mold photosensor, reflective mold photosensor, etc. are used. The resist sensor 105 is a sensor which detects a form tip, in order to take the synchronization at image formation equipment and the tip of a feed form, and it usually arranges transparency mold photosensor or reflective mold photosensor near the conveyance roller in many cases. The top-face detection sensor 106 and the inferior-surface-of-tongue detection sensor 107 are sensors for

detecting the limitation of vertical movement of a form set tray, and CPU gives the command which stops [stop and it forward-reverses / command] the rise motor 103 to the motorised circuit 109 based on the input from these sensors. [0027] A paper and a sensor 108 are sensors which detect whether the form is set or not, and when it is detected that the form is not set, CPU does not perform feed actuation to the feed signal from image formation equipment. As for each sensors 106-108 mentioned above, it is common to use transparency mold photosensor or reflective mold photosensor. The pickup solenoid 16 is for pressurizing a pickup roller 3 on the maximum top-face form on a form set tray. The feed roller clutch 37 is for transmitting the drive of the feed motor 40 to a feed roller 37. The reverse roller clutch 48 is for the powder clutch which can be changed in transfer torque, a hysteresis clutch, or an induction clutch being used in proportion [almost] to change of the exciting current by the current control circuit 111, and changing the transfer torque to a reverse roller based on the current control-command data from CPU101. Drawing 12 expresses the situation of a command data setup to the set current control circuit 111 from the thickness of paper of a form, and CPU101 for every size.

[0028] Next, actuation of this example is explained with reference to drawing 13 thru/or drawing 20 . First, if it detects that covering was closed by the covering closing motion detection sensor 104 (step S1) The paper size set based on the paper-size data inputted from the body control unit which is not illustrated is judged (step S2). A form is raised until it detects the maximum top face of the form with which the rise motor 103 which is not illustrated was made to drive in the rise direction, and the top-face detection sensor 106 was set (step S3). As shown in drawing 12 from the paper size obtained at (step S2) here, it is the data buffer Rf for a command to the current control circuit 111 about current control data R1n in the case of being the thinnest of thickness of paper. It loads and the limit torque in feed CL 1 is determined that the transfer torque of the reverse roller 20 should be controlled (step S4).

[0029] Next, a pickup roller 3 is made to pressurize the maximum top face of the set form by the drive of pickup SOL 16, and a feed roller 8 and the reverse roller 20 separate the form which drove the feed motor 40 after a drive and let out the feed CL 48 and Feed CL 37 for transmitting the drive of the feed motor 40 to a feed roller 8 and the reverse roller 20 with the pickup roller 3 (step S5).

[0030] Under the present circumstances, as shown in drawing 4 , when the thickness-of-paper detection sensor 51 arranged near a feed roller 8 and the reverse roller 20 does not turn on It is judged that the set-up limit torque was an unsuitable value. the thickness of paper of the set form -- receiving (step S2) -- In order to change limit torque, it is the buffer Rf for a command for current control. While loading R4n (refer to drawing 12) corresponding to the most general thickness of paper (55kg paper), separation actuation is performed again.

[0031] In spite of having performed re-separation, when the thickness-of-paper detection sensor 51 does not turn on, it judges with form non-delivery and the data which indicate by JAM to up to the screen of a body are transmitted (step S6). It judges whether when a thickness-of-paper detection sensor turns on, it is larger than the twice of the detection data d at the time of form **** of thickness of paper with the thinnest thickness-of-paper detection data (value set up beforehand). When larger than twice, that it should be judged as those of a double feed with possibility, and a double feed should be prevented, limit torque of the reverse roller 20 is enlarged, and is returned, the force is increased, and return actuation of double feed paper with the predetermined time (flow chart for 2 seconds) reverse roller 20 is made to continue (step S7). If thickness-of-paper detection data change with these return actuation (thickness of paper decreases), a double feed will choose a Rmn value so that the limit torque which was suitable for decision paper and the newly detected thickness-of-paper detection data in having been canceled can be acquired, and it is Rf to the thickness-of-paper memory 102. A value is stored (step S8). If the resist sensor 105 detects the tip of a form, the feed motor 40 stops a drive and will be in the condition of the waiting for the feed signal from a body (step S9).

[0032] the case where change of thickness of paper is not detected in (step S8) on the other hand -- not a double feed but thickness of paper -- it judges that thick paper was set, the drive of the feed motor 40 is stopped temporarily (step S10), and it shifts to the usual feed actuation. If the thickness-of-paper detection sensor 51 becomes OFF (condition of having not detected thickness at all) after checking that the form is set by the paper and the sensor 108 in feed actuation In order to transmit a drive to a feed roller 8 and the reverse roller 20 at the same time it pressurizes a pickup roller 3, CL48 and CL37 are made to turn on. After securing sufficient time amount from which pickup SOL16, CL48, and CL37 will be in ON condition by the time delay, the drive of the feed motor 40 is started (step S11).

[0033] Next, to the timing as which a form is detected by the thickness-of-paper detection sensor 51, since separation of a form is made by the reverse roller 20 and the feed roller 8, in order to lose the effect of separation ***** by the pressurization of a pickup roller 3, if Pickup SOL is made to turn off and a form tip is detected by the resist sensor, CL48, CL37, and the feed motor 40 are made to turn off, and it will be in the condition of the waiting for the feed signal from a body (step S12).

[0034] It will be fed with one sheet of form at a time by the drive of the feed motor 40 if the feed signal from the

condition (step S9) and (step S12) body of the waiting for a feed signal is received (step S13). When the back end of the form with which the resist sensor fed was detected (step S14) and thickness of paper does not change even if it adds a feed count and carries out predetermined number-of-sheets (flow chart ten sheets) feeding, the limit torque of the reverse roller 20 is changed into the value suitable for detector paper thickness, and limit torque is not changed until there is change of thickness of paper henceforth (step S15). When there is change of thickness of paper, the flow of operation at the time of the double feed detection in (step S7) is followed. The following form which can be set if there is nothing about change of thickness of paper (step S11) is taken up, actuation is continued to the condition of the waiting for the following feed signal, and it feeds with a form one by one.

[0035] Improvement is [whenever / allowances / over efficient-izing of the form return force, the temperature rise of feed CL 48, and a life] expectable by carrying out the intermittent control action of the drive of feed CL 48 at the time of feed CL48ON. Then, the duty flows of control of CL48 are shown in drawing 20 . turning off feed CL 48 at the time of ON and the port output OFF at the time of the port output ON, the feed CL 48 on a flow chart means the flag on clutch actuation. If a clutch will be in ON condition from for 800ms and an on-timer is set to 800ms or more when feed CL 48 becomes OFF->ON, a clutch will be switched to an OFF condition for 200ms (step S16). After 200ms, an on-timer is again set to phi, a clutch is made to turn on and a clutch is again changed into an OFF condition after 800ms progress (step S17). By repeating this successively, the on-off operation of CL48 as shown in drawing 10 becomes possible.

[0036]

[Effect of the Invention] According to this invention, effectiveness as taken below can be acquired, respectively as above. First, since ***** of a reverse roller is controllable based on the information on a thickness detection means, rather than the papers adhesion force at the time of double feed generating, ***** with a reverse roller can be enlarged and a double feed can be canceled certainly. At this time, by arranging a thickness detection means near the separation means, early detection of change of a double feed and thickness of paper can be attained, and the improvement responsibility of separability ability can be raised. Moreover, through a transfer torque control means, since it is electrically controllable, high separative power can be demonstrated for control of ***** of a reverse roller with a comparatively easy configuration.

[0037] Moreover, since the intermittent control action of the reverse roller can be carried out, while being able to raise the double-feed-prevention effectiveness, the endurance of a reverse roller can be raised. Moreover, since it can change into the separation conditions for double feed prevention when [twice / more than / as many as the **** possible minimum thickness of paper] thickness-of-paper detection is carried out, the double feed prevention stabilized from the 1st feeding becomes possible. Moreover, since ***** of a reverse roller is again looked over after predetermined time progress, an early judging is attained [whether the double feed occurred and].

[0038] Moreover, since ***** of the reverse roller which amended a resisted part about the self-weight of the form by the paper size can be set up, the feed which was not based on size but was stabilized is attained. Moreover, since the detection value by the thickness detection means is memorizable, a setup of the separation conditions corresponding to the existing sheet is attained also immediately after returning a machine to an initial state by power-source OFF/ON etc. furthermore, the time of a thickness-of-paper detection value being under 2 double [of the **** possible minimum thickness of paper] -- the number copy of predetermined sheets -- the double feed detection precision over the set form can be raised after paper by updating a double feed decision value to this thickness-of-paper detection value.

[Translation done.]

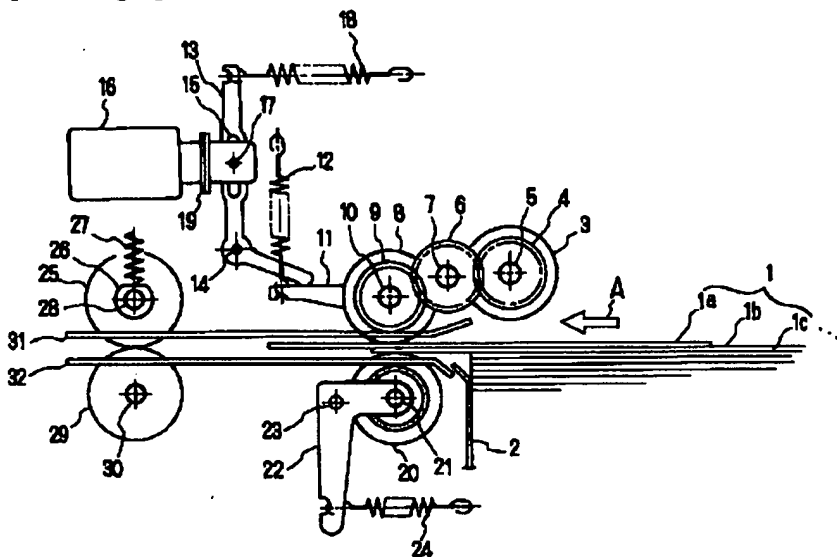
* NOTICES *

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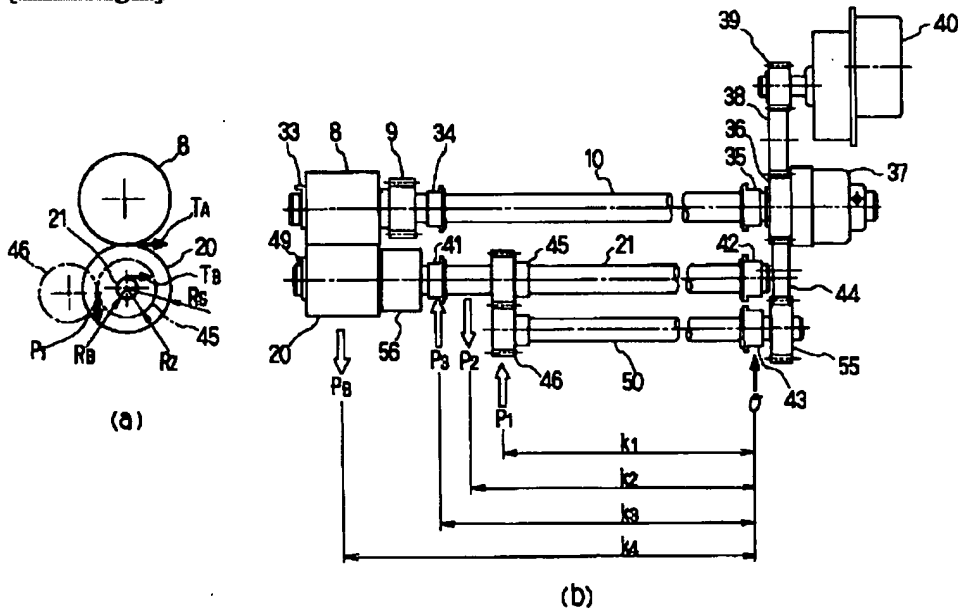
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

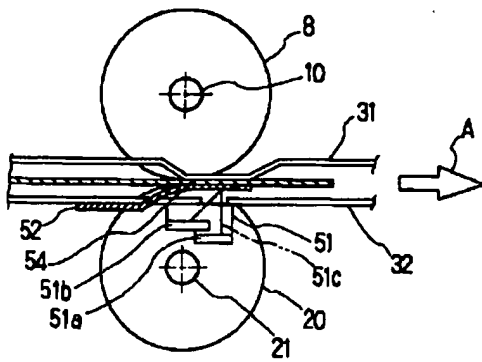
[Drawing 1]



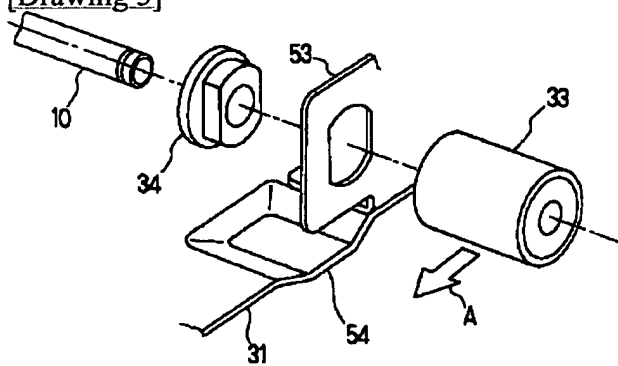
[Drawing 2]



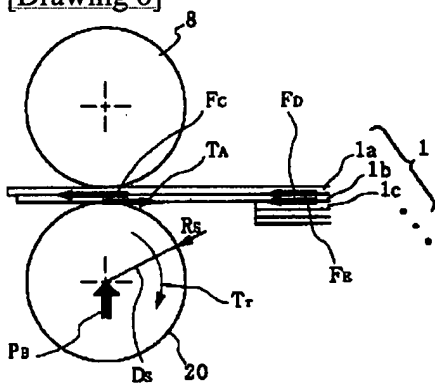
[Drawing 4]



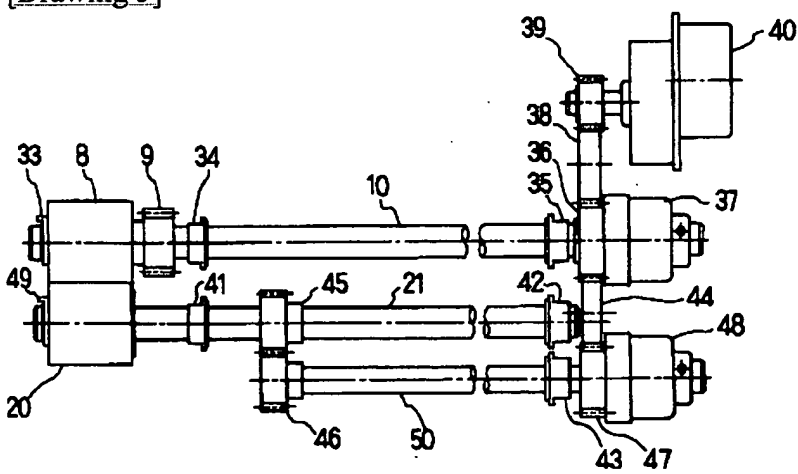
[Drawing 5]



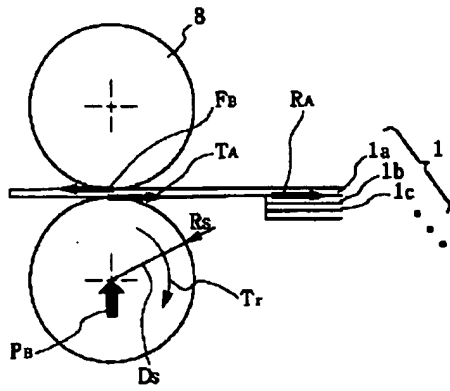
[Drawing 6]



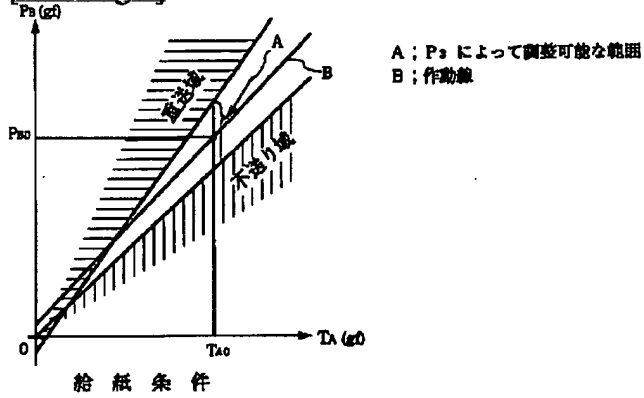
[Drawing 3]



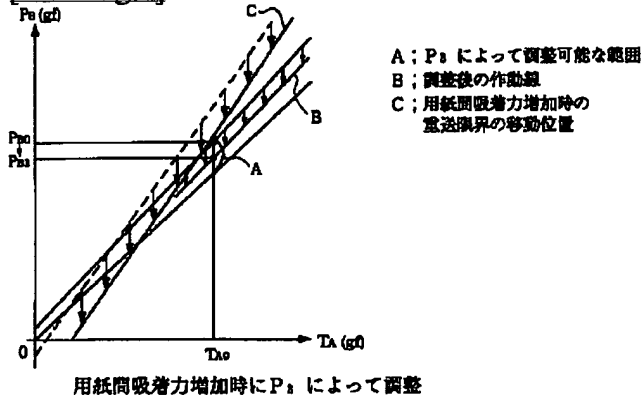
[Drawing 7]



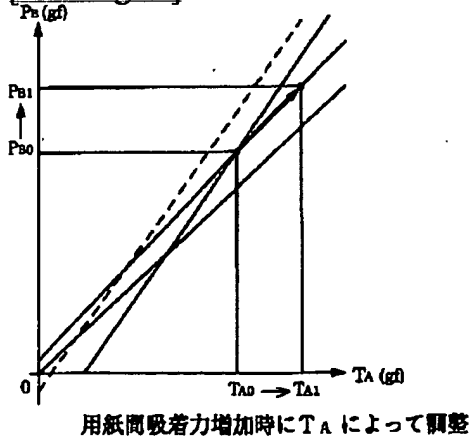
[Drawing 8]



[Drawing 9]



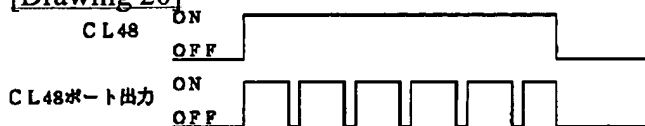
[Drawing 10]



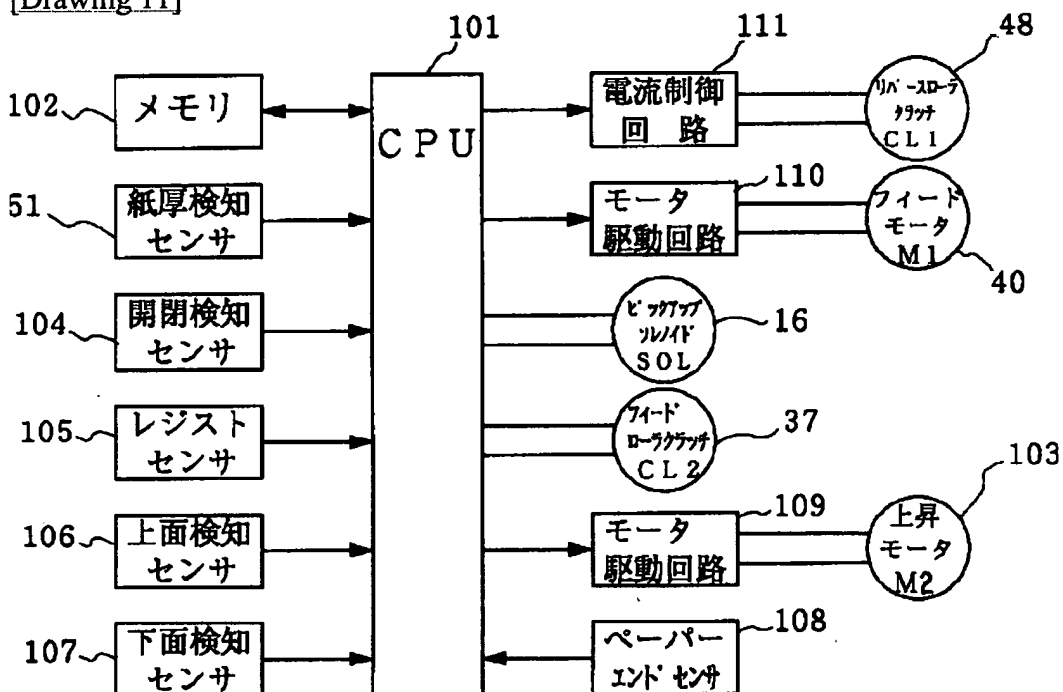
[Drawing 12]

紙厚 サイズ	A 6	B 6	A 5	...	...	A 4	B 4	A 3
30 k	R11	R12	R13	...	...	R15	R16	R17
45 k	R21	R22	R23	...	...	R25	R26	R27
...
...
110k	R61	R62	R63	...	...	R65	R66	R67
135k	R71	R72	R73	...	...	R75	R76	R77

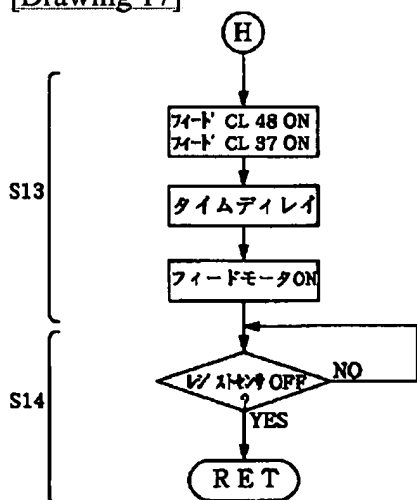
[Drawing 20]



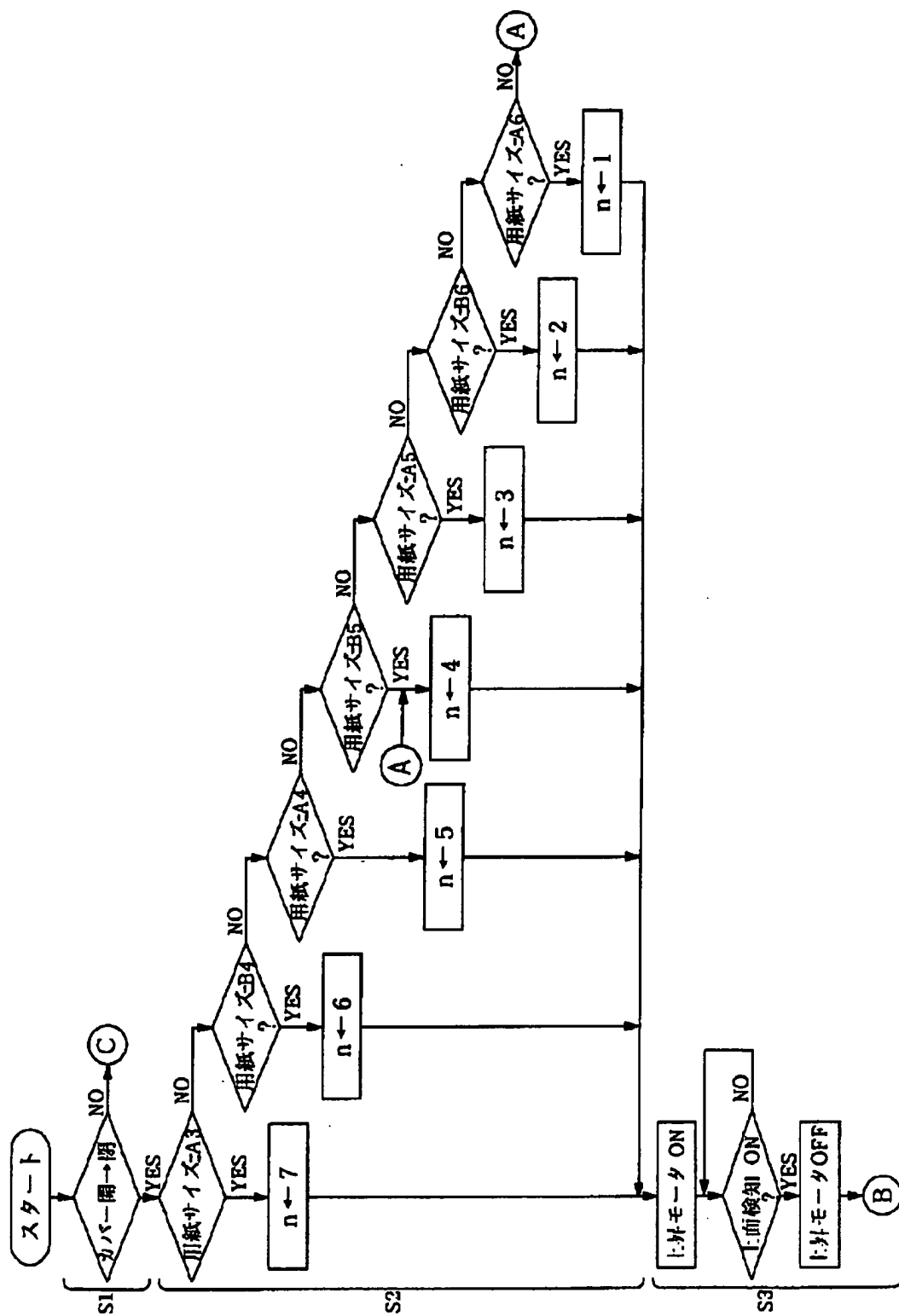
[Drawing 11]



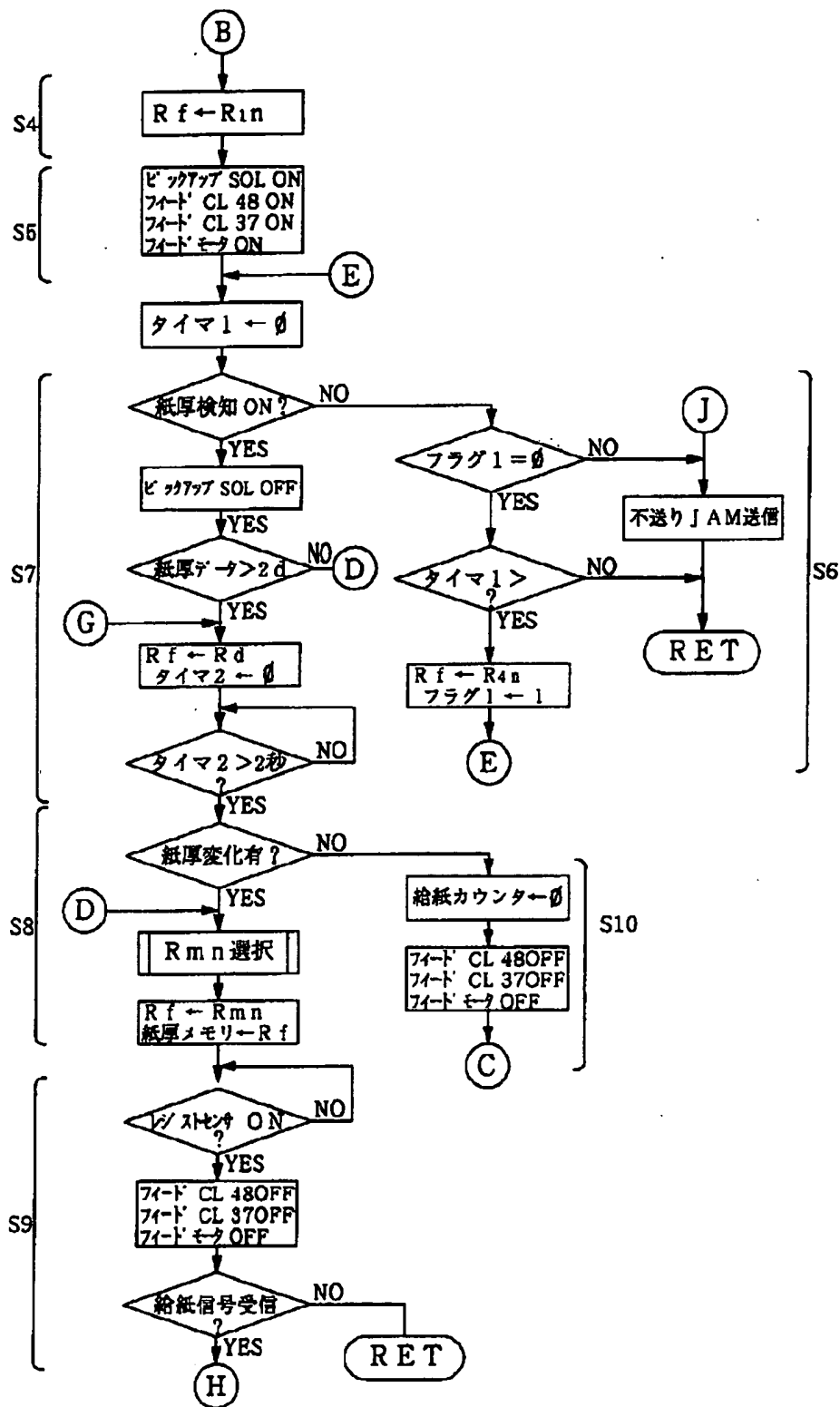
[Drawing 17]



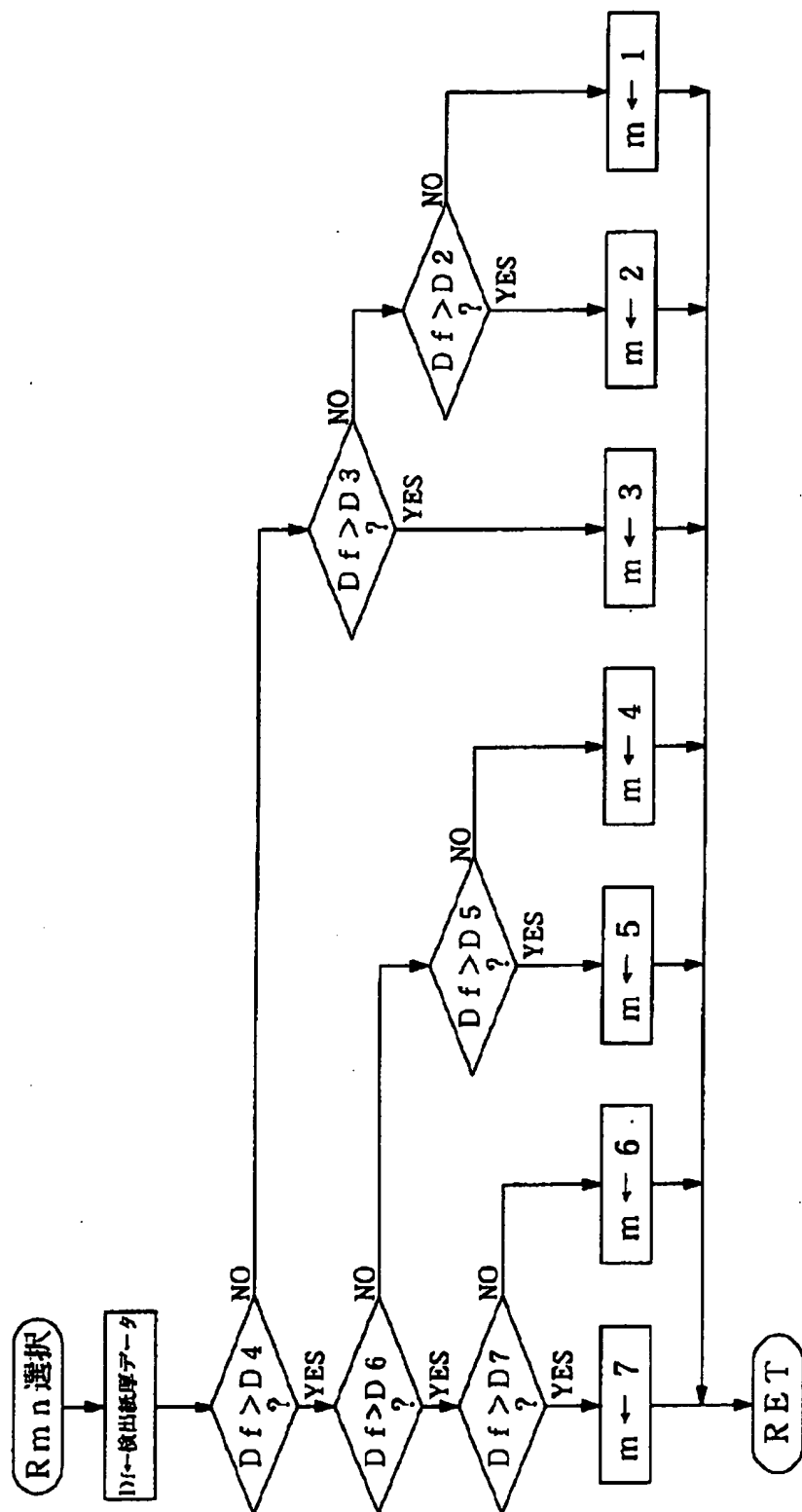
[Drawing 13]



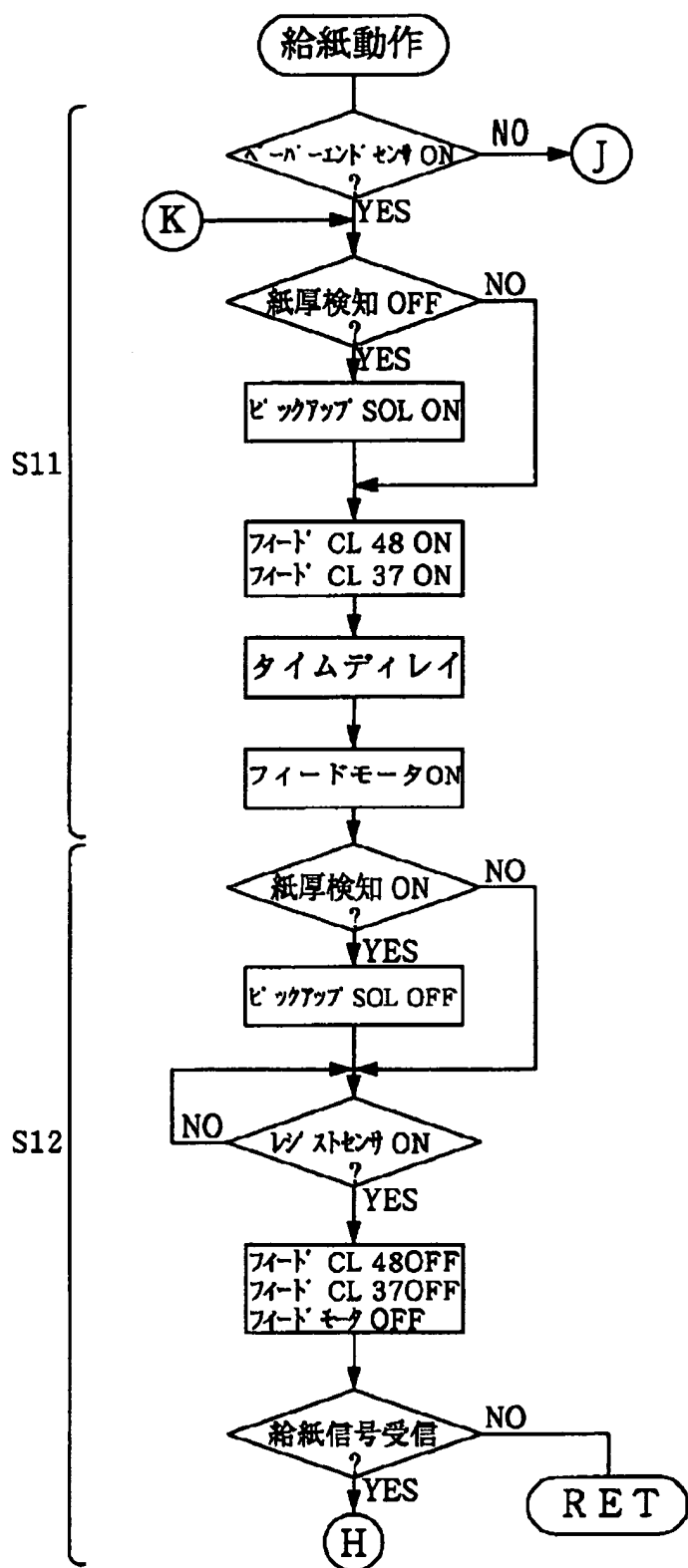
[Drawing 14]



[Drawing 15]

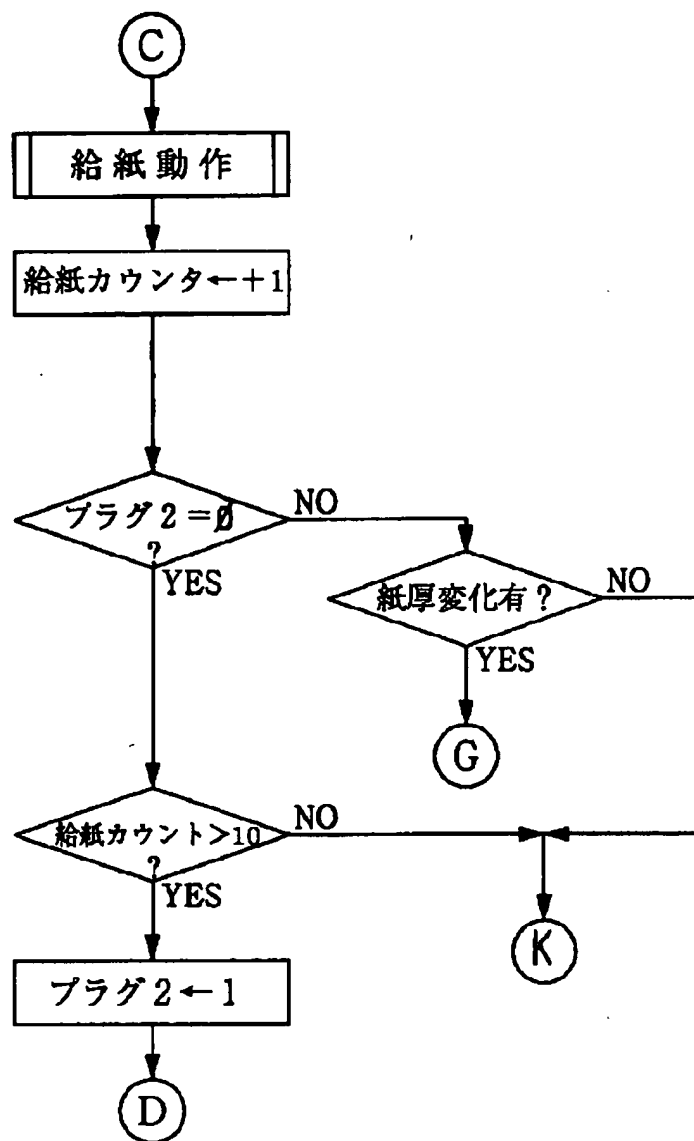


[Drawing 16]

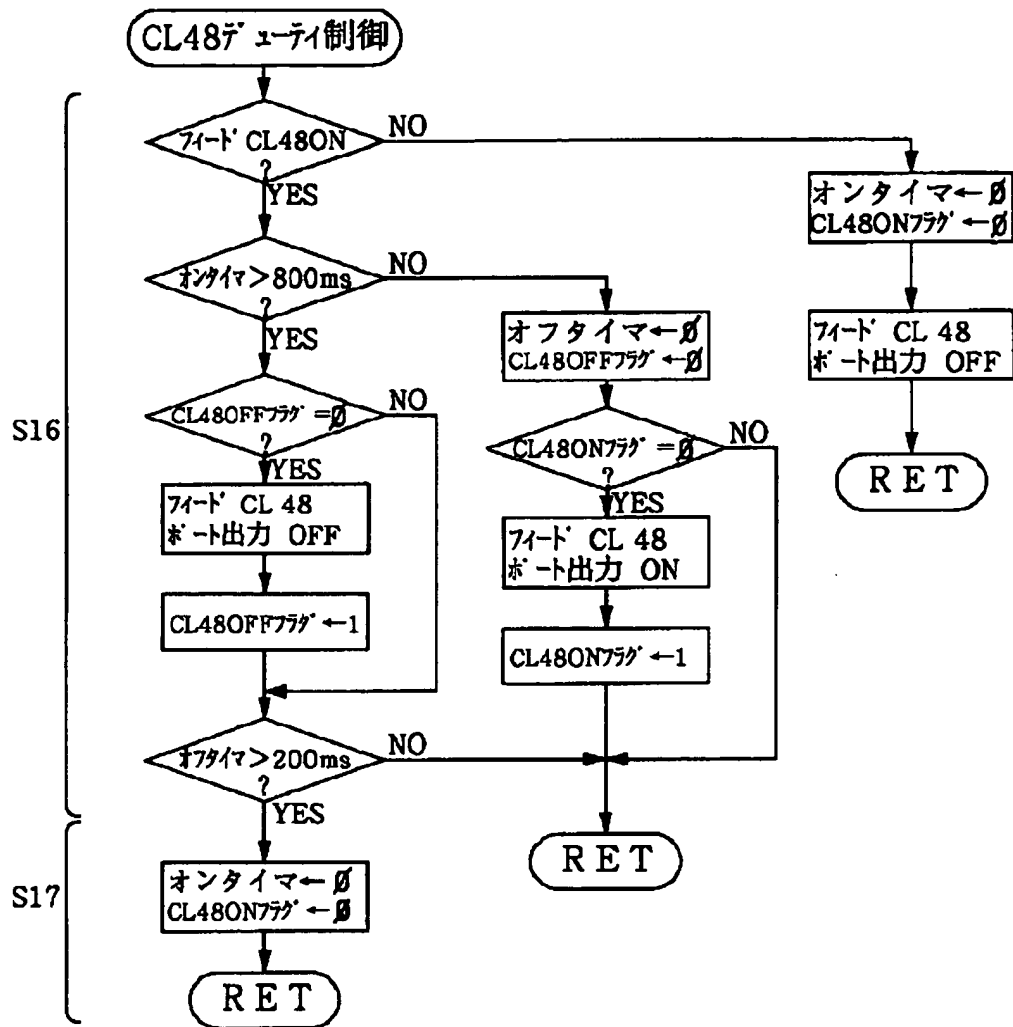


[Drawing 18]

S15



[Drawing 19]



[Translation done.]